Bill Nye the Science Guy

# Flowers

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# Implementation Guide

***Welcome to Disney's Bill Nye DVD collection! With the help of this Guide you can bring instructional DVDs into your science curriculum.***

## What's on the DVD?

Bill Nye DVDs expand the educational features of *Bill Nye the Science Guy* programs. Each DVD provides students with science content through video clips aligned with *National Science Education Standards (NSES)* and a host of other resources.

Short video clips aligned with the NSES provide a unique opportunity for you to enhance your lessons using DVD technology. Now you can show a video clip, or even short segments of a clip, on command. But there are a host of other features, too! See the chart below for a summary.

### From the Main menu, there are three chief sections:

| Feature | Description |
|---|---|
| Watch Program Menu | From this menu, you can play the program straight through or use the clips to customize your viewing. |
| Teacher Support | From this menu, you can access this Teacher's Guide, the Glossary, Internet Links, and the Quiz. |
| Bonus Materials | Use this menu to try a different discussion starter, download a special screen-saver, or check out never-before-seen footage. |

### From the Watch Program menu, you can:

| Feature | Description |
|---|---|
| Play Program | Play the entire program from start to finish. |
| Bilingual Mode | View the entire program or clips in English or Spanish. |
| Glossary Mode | Make links to Glossary terms appear during the program. |
| Program Overview | View the program introduction, in which Bill discusses the topic covered. |
| Try This | Show students demonstrating science concepts. |
| Way Cool Scientist | Meet a real scientist who talks about his or her area of study. |
| Bill's Demonstration | Look at a science demonstration conducted by Bill Nye. |
| Music Video | Enjoy a short music video that summarizes the topic in an age-appropriate and entertaining manner. |
| Science Standards | Take advantage of short video clips from the program, which are aligned with National Science Education Standards. |

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### From the Teacher Support menu, you can:

| Feature | Description |
|---|---|
| Science Quiz | Give students a quiz to take independently or as a class. Seven to ten quiz items are aligned with the National Science Education Standards. The items are in multiple-choice or true-false format. Each wrong answer links to a standards-aligned video clip. At the end of the quiz, a scoring function reveals the number of correct initial answers. |
| Glossary | Check out definitions of key terms and view video clips that reinforce the concepts. |
| DVD Features | View a quick overview of the features found on the DVD. |
| Teacher's Guide | Print out or view this comprehensive Teacher's Guide in PDF format. |
| Internet Link | Link to the Bill Nye area of Disney's Edustation Web site, where you can find links to Internet sites related to the content of each Bill Nye program. |

### From the Bonus Materials menu, you can:

| Feature | Description |
|---|---|
| Bonus Material | Find out what *wasn't* in the episode! In most cases, there's more of the Way Cool Scientist interview, Bill Nye outtakes, and an extra discussion starter. |
| Additional Clips | See trailers of related DVDs and videos. |
| Screen-Saver | Download this cool screen-saver for your computer. |

## The Planning Process

This Guide provides a Lesson Planning Worksheet (see page 12), which can assist you in setting up your instruction around a topic. The following sections of this Implementation Guide are offered to assist your planning process:

- **Determining Objectives and Linking to Standards**
- **The Learning Cycle**
  - **Explore**
  - **Apply**
  - **Extend**
  - **Assess**

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## Determining Objectives and Linking to Standards

1. The NSES Teaching Standard A states that science teachers must "select science content and adapt and design curricula to meet the interest, knowledge, understanding, abilities, and experience of students."

   The NSES recommends that teachers "integrate . . . a practical structure for the sequence of activities, and the content to be learned." The primary instructional model recommended by the NSES is inquiry into authentic student-generated questions about natural or designed phenomena. Since most state and local standards documents were derived from the NSES, you will find that your local and state standards match closely with content standards in the Bill Nye DVD.

   Each DVD contains a menu of clips that are aligned with the NSES. You can review the standards and their aligned clips in the Science Standards menu under Watch Program. Also, the Standards listed on page 10 of this Guide allow you to look at additional NSES content standards that are addressed on the video. Here's an example of the content standards and clips aligned with the Bill Nye DVD entitled *Blood and Circulation*:

### Life Science Standards (NSES) Addressed in *Blood and Circulation*

**Life Science:**
**Structure and function in living systems**

- **Living systems at all levels of organization demonstrate the complementary nature of structure and function.**

  **Aligned clips:**

  - **1 Blood vessels**
  - **2 Heart pump and bloodstream**
  - **3 Heart valves and blood circulation**
  - **4 White blood cells**
  - **5 Capillaries**

- **The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection.**

  **Aligned clips:**

  - **6 Heart pump**
  - **7 Heart muscle**
  - **8 Pumping blood to brain**

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2. Determine your objectives for the lesson and how these objectives address the standards.

### Sample Objectives for *Blood and Circulation*

**In this activity students will:**

- **Observe and describe a body system responsible for supply and transport.**
- **Use this information to define a body system.**
- **Ask questions about the circulatory system.**
- **Explain how structure complements function in organs of the circulatory system.**
- **Cite examples of current research related to this system.**

3. Design a learning cycle of instructional experiences and assessments for the students to engage in that will help students meet these standards. Students may be given teacher-planned investigations or may be guided to design their own investigations.

## The Learning Cycle

The learning cycle is a sequence of activities that involve students in the learning process. The sequence found here is based on research from Lawson**,** Abraham, and Renner published in 1989. That has been adapted to include: Explore, Apply, Extend and Assess:

**Explore:** Involves assessing students' prior knowledge and providing opportunities for students to interact with content from the video.

**Apply:** Includes having students use the content learned during the Explore section in a new way that is meaningful to future learning.

**Extend:** Allows students to conduct further research around an area of interest within the topic.

**Assess:** Provides strategies meant to inform students and teachers about the content and processes that have been learned.

## Explore

The NSES Teaching Standard B states: "Teachers of science guide and facilitate learning." This standard addresses the constant need to balance your predetermined goals with allowing students to set and meet their own learning goals.

*Focus and Support Inquiries*: Support student inquiries by making decisions about "when to provide information" and "when to connect students with other sources." Knowing the best time to intervene is often determined by allowing students to ask questions and to explore concepts openly.

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The NSES Teaching Standard C states: "Teachers of science engage in ongoing assessment of their teaching and of student learning."

*Assess in Order to Guide Teaching:* The Program Overview or the Discussion Starter on the DVD can be used to gauge students' prior knowledge. You can use student responses to make decisions about appropriate instruction and adaptations in order to meet the needs of individual students. Assessment can be in the form of student reflections from standards-aligned video clips or answers to questions found on the science quiz. Or, as in the following example, a simple graphic organizer can facilitate a formative assessment.

### Example: T-Chart from *Blood and Circulation*

1. Ask students to fill out the "Know-New" T-Chart (see page 14). Have them list what they already know about the circulatory system (heart, blood vessels, blood, etc.) on the left side of their charts.

2. Show the Program Overview for *Blood and Circulation*. On the right side of the chart, have students list new things they have learned from watching the clip. Walk around the room and assist students in filling in their T-Charts. Replay the program as necessary to allow students to review sections of interest.

3. Once students have completed their charts, ask them to share what they have listed in the "New" column. Write these on the board. Have students write their own working definitions of the circulatory system. Once students have completed their definitions, collect and review their work to assess prior knowledge.

Conduct direct vocabulary instruction in the Explore phase. Research suggests that:

- Students must encounter words in context more than once to learn them.
- Instruction in new words enhances learning those words in context.
- One of the best ways to learn a new word is to associate an image with it.
- Direct vocabulary instruction on words that are critical to new content produces the most powerful learning.

Use the DVD Glossary with the linked video clips to expose students to new vocabulary words in context, along with associated video images. You can also find a printed version of the glossary terms in this Guide on page 16.

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### Example: Using the Glossary for Direct Vocabulary Instruction
### *Blood and Circulation*

1. Present students with a brief explanation or description of the new term or phrase from the glossary. For example: “Capillary: A small blood vessel that connects arteries and veins.”
2. Present students with a nonlinguistic representation of the new term or phrase. Show the video clip associated with the term “capillary.”
3. Ask students to generate their own verbal description of “capillary.”
4. Ask students to create their own nonlinguistic representation of “capillary.”
5. Periodically ask students to review the accuracy of their explanations and representations. This can be done after the Apply activities.

## Apply

Based on the information you gained from the Explore assessments, design appropriate activities for your students. Check the experiments listed in the Episode Guide (see page 11) for explanations of the demonstrations from the Bill Nye program as well as for additional experiments designed to help apply the knowledge gained.

In the following example from *Blood and Circulation*, the standards-based video clips provide background information, and an experiment from the Guide helps students apply what they have learned about arteries and veins.

### Example: The Structure and Function of Arteries and Veins

1. Have students begin “Know-New” T-Charts, focusing on what they already know about the structure and function of blood vessels, arteries, and veins.
2. Watch the following chapters from the Bill Nye DVD *Blood and Circulation*:
   - Blood vessels
   - Heart pump and bloodstream
   - Capillaries
3. Complete the “Know-New” T-Charts.
4. Give students copies of the Student Recording Sheet (see page 15) and have them fill the sheets out as they conduct their experiments.
5. Do the experiment entitled “Pump it Up!” from the *Blood and Circulation* Episode Guide, in which students observe the apparent effects of pressure on arteries and veins.
6. Write down any remaining questions about the structure and function of blood vessels, arteries, and veins.

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## Extend

The NSES Teaching Standard D states: "Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science." School administrators, parents, and the community can assist teachers in providing local resources that make science lessons pertinent and meaningful.

*Identify and Use Resources Outside of the School:* "The school science program must extend beyond the walls of the school." Each Bill Nye DVD contains resources designed to facilitate such understanding, including:

- Way Cool Scientist, found in both Watch Program and Bonus Materials, in which scientists discuss their current areas of study. This real-world connection often results in a deeper student understanding of a particular career.
- Disney's Edustation Web site, where relevant Internet links provide a starting point for students to further explore science topics.
- Try these video clips, with activities parents and students can do at home. The questions generated by students from these experiences can be used as foundations from which they may conduct their own research.
- Standards-aligned video clips and Bill's demonstration video clips, which can help generate topics for further research. After viewing the clips, have students list their questions, perhaps about the most current developments in a topic. By conducting online or library research, students will find answers to their questions and will learn about a topic in greater depth.

### Example: Conducting Student Research Using *Blood and Circulation*

Ask students to choose one of the questions they had after completing the activities from *Blood and Circulation*. An example of a student research question might be, "How has the technology related to artificial hearts advanced in the last ten years?" Explain to students that they will be conducting research to find answers to their questions. Some students may want to complete online or library research, others may want to ask an expert in the field, while others may want to design and conduct a scientific investigation. Encourage students to write a detailed procedure for finding answers to their questions. Ask students to find one or more examples of current research dealing with the circulatory system that is related to their question. NOTE: Students with similar questions may work together to complete the assignment.

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## Assess

Once students have conducted the research, you may choose to assess them in a number of different ways:

- By having students write about what they learned in a journal.
- By having students submit projects or reports.
- By having students take the program quiz to gauge their understanding of certain facts in the video. You can either print the quiz (found in this Guide on page 18) and have each student complete it individually or use the DVD screen version and the scoring feature for whole-class assessment.
- By designing other standards-aligned questions to augment those that are provided.

While the quiz will provide you with information about what the students have learned, it does not assess how students have processed the information. Below you will find assessment ideas that can be used to measure both content and process.

### A Sample Assessment for *Blood and Circulation*

1. Explain to students that an important aspect of scientific inquiry is to communicate findings to others. In this assessment, students will present the following information to their peers:
   - The question they investigated.
   - The method that was used to find answers to their question.
   - Problems or successes during the search.
   - Answers to their question.
   - Current research related to their question.
   - New questions that have arisen.
2. Distribute the rubric found in the Lesson Planning Worksheet (see page 13) to students so they know how they will be assessed. Make sure students understand the criteria found in the rubric. Before you begin, you may want to allow students to make changes to the rubric so that it is clearer or makes more sense from their perspectives.
3. Allow students time to gather information to answer their questions and to prepare for their presentations. As students conduct this work, walk around the room and ask questions to assess their progress and provide input as needed.
4. Take a few minutes to clarify the rules of the presentation with the students. You may want to have multiple copies of the rubric available so that peers can rate the presentations.
5. As presentations are made, assess the quality of the student's work as thoroughly and as equitably as you possibly can.

Congratulations! You have now completed the steps to set up a lesson plan using the Lesson Planning Worksheet. You have also explored many of the features of the Bill Nye DVD as well as the supplemental information found in this Teacher's Guide. And most important, you've made significant strides toward incorporating DVD technology into your day-to-day instruction.

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# National Science Education Standards

## *Flowers*

### *Standards/Benchmarks*

## Grades 5-8

## Science as Inquiry

### Abilities necessary to do scientific inquiry

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.

### Understandings about scientific inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.

## Physical Science

### Transfer of energy

- The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

## Life Science

### Reproduction and heredity

- Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.
- In many species, including humans, females produce eggs and males produce sperm. Plants also reproduce sexually—the egg and sperm are produced in the flowers of flowering plants. An egg and sperm unite to begin development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.
- Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another.

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- The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.

### Regulation and behavior

- All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

## History and Nature of Science

### Science as a human endeavor

- Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.

- Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

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# Episode Guide

## *Flowers*

| Nifty Questions in This Episode | Awesome Answers |
|---|---|
| Where do flowers come from? | From flower seeds. |
| What is the male part of a flower called? The female part? | Stamen. Female part is called pistil. |
| How are flowers fertilized? | Eggs are produced inside the pistil, pollen from the stamen fertilizes the eggs from the same flower. |
| How does pollen spread to fertilize the flower? | Birds, bees, wind, and animals help spread pollen. |

## Experiments shown on the video:

### FLOWERS AT WORK

***Objective: To demonstrate how water can carry nutrients through a flower.***

- Fill two glasses with very hot water and pour a lot of red food coloring in one glass.
- Use a white carnation and split the stem down the middle 3/4 of the way up from the bottom of the stem.
- Place one part of the stem into the red glass and the other end into the clear water glass. After about an hour, you will notice that half of the flower will change color.

## More interesting stuff to do:

### GIVE ME THE UV

***Objective: To demonstrate the effects of sunlight on plant growth.***

- Cut cardboard into six different lengths to fit inside a shoebox. No piece should be longer than 3/4 of the box's width, but high enough to touch the lid. Place the pieces inside the shoe box to form a maze.
- At one end of the box, place a plant in some plotting soil (ivy, bean, vine, etc.).
- Water plant and place lid on shoe box, cutting a 1-inch hole in the top of the lid at the opposite end of the box from the plant.
- After a few days, observe the path the plant travels as it finds its way toward the light.
- After the plant gets through the hole, remove the lid.

### TURNING GREEN...THEN YELLOW

***Objective: To demonstrate the color pigments in plants necessary for photosynthesis.***

- Place a sturdy leaf top side down on the edge of some filter paper or a coffee filter.
- With a butter knife or a coin, rub the leaf about 1/2 inch from the edge of the filter paper, leaving a green spot on the filter paper.
- Rub a new portion of the leaf at the same spot on the filter paper.
- Place the filter paper on top of a small jar.
- Cut the paper so that the strip with the green spot hangs down into the jar, while the remaining paper rests on top of the jar.
- Remove paper and fill jar 3/4 full with rubbing alcohol.
- Replace filter with its strip in the jar, making sure that the alcohol does not pass the green spot. Alcohol will "climb" up strip and green spot will turn red, then yellow, the way leaves do in the fall.

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*Bill Nye the Science Guy*

# Lesson Planning Worksheet

**Lesson Title** _____

**Objectives** _____

_____

_____

**Estimated Time Required** _____

**Materials Needed** _____

_____

**National Science Educational Standards**

_____

_____

_____

_____

_____

**Explore** _____

_____

_____

_____

**Apply** _____

_____

_____

_____

**Extend** _____

_____

_____

_____

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## Assess

As presentations are made, assess the quality of the student's work as thoroughly and as equitably as you possibly can. The following criteria can be used to assist in your assessment.

Name of Student _____

Question Investigated _____

| Initial Question | | | |
|---|---|---|---|
| 1<br>Question is broad and not well defined | 2<br>Question is defined but limited to single-answer responses. | 3<br>Question is clear and might elicit multiple responses that may lead to new ideas and additional questions. | 4<br>Question is engaging and provokes new ways of thinking about an issue. |
| **Methods for Finding Answers** | | | |
| 1<br>Students do not share planned or actual methods. | 2<br>Students share methods but they are unclear or vague. | 3<br>Students share methods but not the problems or successes of using the methods. | 4<br>Students share methods and problems or successes in using the methods. |
| **Results** | | | |
| 1<br>Student results are undefined. | 2<br>Student results are incomplete and do not adequately answer the question. | 3<br>Student results are complete, adequately answer the question, and include current research related to the question. | 4<br>Student results are complete, include current research, and have resulted in one or more additional questions. |
| **Communication** | | | |
| 1<br>Student is not prepared to speak. | 2<br>Presenter has distracting mannerisms and avoids eye contact with the audience. | 3<br>Presentation is clean and clear with some eye contact and very few distractions. | 4<br>Presentation is exceptional and unique. Presenter uses regular eye contact and avoids distractions. |

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*Bill Nye the Science Guy*

# Student "Know / New" Chart

| Know | New |
| --- | --- |
| Write down what you know about the topic of the video. | Write down information from the video that is new to you. |
| | |

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# Student Recording Sheet

Name _____ Date _____

Title of Experiment _____

Question: (What are you testing?) _____

Procedure: (Describe the experiment) _____

Materials: (List what you used) _____

Observations: (Record what happened) _____

Results: (Make your own data table)

Conclusions: (Use your observations and results to describe what you learned)

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# Glossary

## *Flowers*

Fold and cut to use as flashcards.

*Bill Nye the Science Guy*

**STAMEN**

**Stamen**
The male reproductive organ of a flowering plant where pollen grains develop.

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**POLLEN**

**Pollen**
The structure in which the sperm forms.

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**PISTIL**

**Pistil**
The female reproductive organ in a flowering plant. The base of the pistil forms the ovary, in which the seeds are formed.

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**EGGS**

**Eggs**
The female reproductive cell.

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Fold and cut to use as flashcards.

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# POLLINATION

**Pollination**

The transfer of pollen from the tip of the stamen to the tip of the pistil.

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# ULTRAVIOLET LIGHT

**Ultraviolet Light**

Has shorter wavelengths than visible light, and therefore is not visible to human.

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# SEED DISPERSAL

**Seed Dispersal**

The spreading of seeds. Seed dispersal happens in several ways such as wind, water, and animals.

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# FRUIT

**Fruit**

The edible parts of the ripened ovaries of seed plants(e.g., watermelon, peaches, squash, and apples).

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Name _____ Date _____

# Quiz

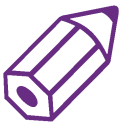
## *Flowers*

## True or False? Circle T or F

1. Flowers reproduce by making seeds. T or F
2. Eggs get fertilized by pollen and grow into a seed. T or F
3. Humans can eat some flowers. T or F
4. Tomatoes are NOT ripened ovaries and therefore are not fruits. T or F
5. Humans do not rely on flowers for food. T or F
6. When flowers make seeds the offspring are exactly the same as the parents. T or F

## Multiple Choice: Circle the letter of the best answer

7. Which part of the flower contains eggs?
   - A. Stamen
   - B. Pistil
   - C. Anther
   - D. Petal
8. What is contained in the stamen of a flower?
   - A. Pollen
   - B. Eggs
   - C. Seeds
   - D. All of the above
9. How do seeds get spread out?
   - A. Seeds in burs stick to animals fur
   - B. They float in the ocean
   - C. Seeds in pods (shaped like helicopters) float through the air
   - D. All of the above
10. What kind of light do bees see?
    - A. The same kind of light that we see (visible)
    - B. Light that is absorbed by the flower (visible)
    - C. Ultraviolet light that is reflected by the flower
    - D. Both A and B



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# Answer Key

## *Flowers*

| | | | |
|---|---|---|---|
| 1. T | 4. F | 7. B | 9. D |
| 2. T | 5. F | 8. A | 10. C |
| 3. T | 6. F | | |

SEED DISPERSAL

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